AFOSR SPACE SCIENCES

15 Jul 05

Major David L. Byers

Program Manager

AFOSR

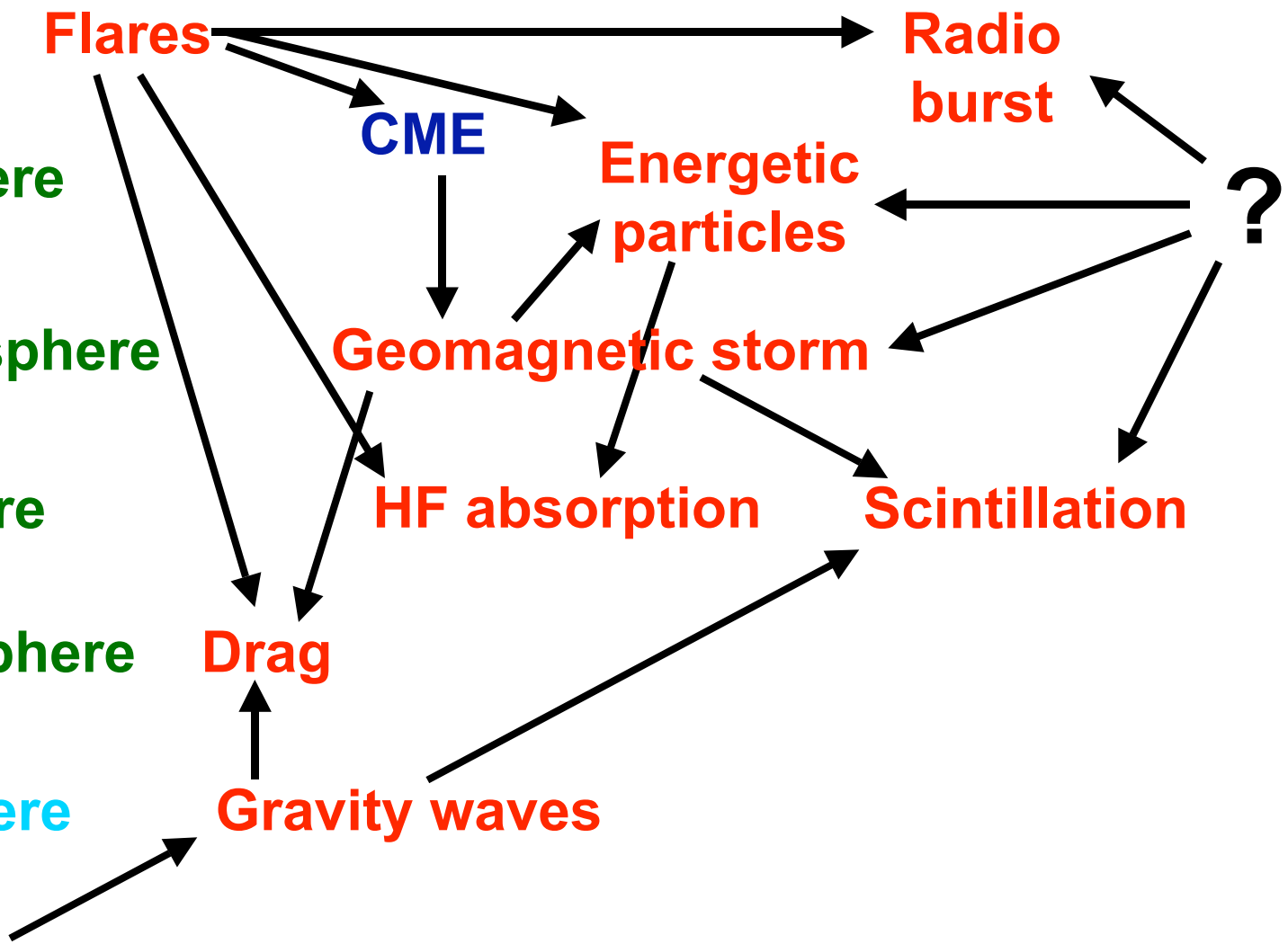
Air Force Research Laboratory

Introduction

- Motivation for AF investment in space weather
- Portfolio overview
- Definitions of AF research funding
- Grant opportunities
- My expectations of proposals

Coupled Space Weather System

- Solar
- Heliosphere
- Magnetosphere
- Ionosphere
- Thermosphere
- Mesosphere
- Terrestrial WX/Ground



Systems Affected by Space Weather

- **Navigation**
  - Scintillation, geomagnetic activity, solar flare, energetic particles
- **Communication**
  - Scintillation, geomagnetic activity, solar flare, energetic particles
- **Space Situational Awareness**
  - Drag, scintillation, ionospheric ion densities
- **Satellite Health**
  - Ionizing radiation, energetic particles, geomagnetic activity
- **Radar**
  - Geomagnetic activity, solar radio bursts
- **Avionics**
  - Ionospheric induced currents, energetic particles

Space Weather Modeling Requirements

- Ionospheric Forecasting (24-96 hours)
- Magnetospheric Forecasting (24-96 hours)
- Solar Wind Forecasting (24-96 hours)
  - Presure
  - Density
  - Energy
  - Magnetic field
  - Electric field
  - Currents
  - Circulation

- Scintillation
- Geomagnetic storms
- Auroral oval location
- South Atlantic anomaly
- Particle precipitation
- Satellite drag

Space Weather Modeling Requirements

- **Solar Emission Forecasting (24-96 hours)**
  - **Flare time, location, and intensity**
  - **Particle and electromagnetic emissions**
  - **Coronal mass Ejections (CMEs)**
  - **Solar Surface parameters**

General Program

- Ionospheric/Magnetospheric Physics
- Solar/Heliospheric Physics
- Space Environment Measurements
- Space Environment Modification

  – Plasma Physics Theory

  – Space Environment Data Assimilation

  – Space Environment Modeling

Basic Research

Basic research is **systematic study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts** without specific applications towards processes or products in mind. It includes all scientific study and experimentation directed toward increasing fundamental knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs.

Applied Research

Applied research is systematic study to understand the means to meet a recognized and specific need. It is a **systematic expansion and application of knowledge to develop useful materials, devices, and systems or methods**. It may be oriented, ultimately, toward the design, development, and improvement of prototypes and new processes to meet general mission area requirements. Applied research may translate promising basic research into solutions for broadly defined military needs, short of system development.

Advanced Technology Development

Advanced Technology Development (ATD) includes concept and technology demonstrations of components and subsystems or system models. The models **may be form, fit and function prototypes or scaled models that serve the same demonstration purpose.** The results of this type of effort **are proof of technological feasibility and assessment of subsystem and component operability and producibility** rather than the development of hardware for service use. ATD includes development of subsystems and components and efforts to integrate subsystems and components into system prototypes for field experiments and/or tests in a simulated environment.

Grants Programs for Researchers

- National Defense Science and Engineering Graduate (NDSEG) Fellowship Program
- United States Air Force Resident Research Associateship (USAF-RRA) Program
- United States Air Force-Summer Faculty Fellowship Program (USAF-SFFP)
- Window on Science (WOS) Program
- Presidential Early Career Award in Science & Engineering (PECASE)

Grant Programs for Research

- Small Business Technology Transfer Program (STTR) The Small Business Innovation Research (SBIR)
- Historically Black Colleges and Universities and Minority Institutions (HBCU/MI) Program
- Defense University Research Instrumentation Program (DURIP)
- Multidisciplinary Research Program of the University Research Initiative (MURI)
- Defense University Research Initiative on NanoTechnology (DURINT)
- Partnerships for Research Excellence and Transition (PRET)

What I Look for in Proposals

- In the abstract, clearly and concisely define
  - the objectives
  - the approach to achieve the objectives
  - the scientific merit of the proposed research
- Explain why the research is leading edge, more revolutionary than evolutionary (one paragraph)
- Explaining why the topic should be of interest to the AF and DoD if it is not immediately obvious (one paragraph)

The Bottom Line

- I hope to get 50 or more white papers
- I plan encourage 10-15 proposals
- I hope fund 5-8 new proposals
- 2006 Time Line
  - White papers due April
  - Proposals due June
  - Prospective funding decisions by October
  - Start date December 1

How does your proposal rate

- Revolutionary, game changing, cutting edge
- Leading
- Evolutionary
- Incremental

- Well planned, high returns